

AD-A214 495 DOCUMENTATION PAGE

Form Approved  
CMB No. 0704-0188

2a. SECURITY CLASSIFICATION AUTHORITY NOV 20 1989		1b. RESTRICTIVE MARKINGS	
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE		3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution is unlimited.	
4. PERFORMING ORGANIZATION REPORT NUMBER		5. MONITORING ORGANIZATION REPORT NUMBER(S) AFOSR-IR-89-1287	
6a. NAME OF PERFORMING ORGANIZATION University of California at Davis	6b. OFFICE SYMBOL (if applicable)	7a. NAME OF MONITORING ORGANIZATION AFOSR/NA	
6c. ADDRESS (City, State, and ZIP Code) Davis, CA 95616		7b. ADDRESS (City, State, and ZIP Code) Building 410, Bolling AFB DC 20332-6448	
8a. NAME OF FUNDING/SPONSORING ORGANIZATION AFOSR/NA	8b. OFFICE SYMBOL (if applicable) NA	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER AFOSR - 86 - 0226	
8c. ADDRESS (City, State, and ZIP Code) Building 410, Bolling AFB DC 20332-6448		10. SOURCE OF FUNDING NUMBERS	
		PROGRAM ELEMENT NO. 61102F	TASK NO. 2917
		TASK NO. A1	WORK UNIT ACCESSION NO.
11. TITLE (Include Security Classification) (U) Acquisition of Analytical Instruments for Combustion Research			
12. PERSONAL AUTHOR(S) C. K. Law			
13a. TYPE OF REPORT Final Report	13b. TIME COVERED FROM 1986 TO 1989	14. DATE OF REPORT (Year, Month, Day) 1989-9-15	15. PAGE COUNT 3
16. SUPPLEMENTARY NOTATION			
17. COSATI CODES		18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)	
FIELD	GROUP	SUB-GROUP	
		Analytical Instruments, Combustion	
19. ABSTRACT (Continue on reverse if necessary and identify by block number)			
<p>A set of thermal analytical instruments and a quadruple mass spectrometer have been acquired for the determination of variations in concentration and chemical composition in reactive systems as well as the identification of key heat-release mechanism and the energetics of new fuel/propellant formulation. The specific instruments acquired are listed.</p>			
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input checked="" type="checkbox"/> DTIC USERS		21. ABSTRACT SECURITY CLASSIFICATION Unclassified	
22a. NAME OF RESPONSIBLE INDIVIDUAL Julian M Tishkoff		22b. TELEPHONE (Include Area Code) (202) 767-0465	22c. OFFICE SYMBOL AFOSR/NA

This is a summary of the instruments purchased by Professor C. K. Law (Principal Investigator) under AFOSR Equipment Grant #86-0226 entitled, "Acquisition of Analytical Instruments for Combustion Research." The budgeted instruments included a thermoanalytical system and a quadrupole mass spectrometer and assorted support equipment. These instruments were acquired for the purpose of determining variations in concentration and chemical composition in reactive systems and identifying the key heat-release mechanisms and quantifying the energetics of new fuel/propellant formulations.

While all the above instruments have been purchased, alternate vendors were selected based on new technology, service and instrument maintenance and cost. The following is a breakdown of the purchased items, listed by name and manufacturer. A brief description has been included where differences with the original budget have occurred.

#### THERMOANALYTICAL INSTRUMENTS

While the original budget allocated funds for a Perkin-Elmer system, a Du Pont system was purchased instead. This change was based on superior sensitivity, versatility, ease of use, low maintenance and cost. The thermoanalytical instrumentation system consists of the following items:

- |  |                    |
|--|--------------------|
| • Thermal Analysis Station*  | Du Pont De Nemours |
| includes differential scanning calorimeter,<br>data analysis system, analysis software and<br>purity/kinetics/heat capacity software options |                    |
| • Thermogravimetric Analyzer*  | Du Pont De Nemours |
| • Six-Pen Graphics Plotter*  | Hewlett-Packard    |
| • Turbo-AT PC*   | Compubyte          |
| w/enhanced graphics card, high resolution<br>NEC color monitor and math coprocessor  |                    |
| • Ten-Channel Data Acquisition System*   | Keithley           |
| • Chart Recorder (dual channel)*   | Thermx             |

#### QUADRUPOLE MASS SPECTROMETER

A Hewlett-Packard system was purchased over the budgeted Finnigan system due to a new advance in quadrupole technology. Hewlett-Packard very recently developed a miniaturized quadrupole system while also making the unit easier and cheaper to service. Their data system can be mastered quickly and their expertise in gas chromatography cannot be matched. The Finnigan system, while offering high sensitivity and flexibility, was not truly a quadrupole and thus suffered from producing non-classical mass spectra. This renders the mass spectral library of limited use and would therefore hinder compound identification, which is the primary goal of our system. The Hewlett-Packard system consists of the following items:

- |   |                 |
|---|-----------------|
| • Mass Selective Detector (5971)  | Hewlett-Packard |
| includes data analysis station, software<br>mass spectral libraries, external tape<br>drive, printer and graphics plotter |                 |

- Gas Chromatograph (5890 Series II)  
includes micro TCD, sample events control module, cryogenic valving, split/splitless injector and capillary columns  
Hewlett-Packard
- Vacuum Pumps  
large\* and small capacity pumps  
VWR Scientific
- Pyroprobe\* and Chamber\*  
includes programmable rate controller and high heating-rate option  
Varian Associates

#### ACCESORIES AND INSTRUMENT INTERFACES

While the following items did not explicitly appear on the budget, they were acquired with funds saved from the purchase of the thermoanalytical and mass spectral instruments. The following items were chosen in order to facilitate the merging of the two major instruments with the principal investigator's existing laser facilities. The creation of a laser-driven fuel-pyrolizer with on-line TGA/DSC/GC/MS holds potential to yield exhaustive qualitative and quantitative thermochemical data under very well controlled conditions. The acquired equipment consists of the following items:

- PS/2 Model 3.0 PC\*  
IBM
- IBM PC Clone  
includes math coprocessor and enhanced graphics card  
Dell Computers
- Oscilloscope  
Tektronics
- Various Optics and Lenses  
TSI Inc.
- Lock-in Amplifier and Light Chopper  
Stanford Instruments
- Spectrometer/Detector  
Princeton Instruments
- Vacuum Oven\*  
Fisher Scientific

Upon transfer of the Principal Investigator from the University of California at Davis to Princeton University, the entire thermoanalytical system and several smaller components of the remaining systems were retained by the University of California. These items have been indicated by an asterisk (\*).

All the appropriated funds were expended.

Accession For	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	